US009264847B2

(12) **United States Patent**
Choi et al.

(10) **Patent No.: US 9,264,847 B2**
(45) **Date of Patent: Feb. 16, 2016**

(54) **METHOD FOR TRANSMITTING SIGNAL USING SHORT RANGE COMMUNICATION AND ELECTRONIC DEVICE THEREOF**

(71) Applicant: **Samsung Electronics Co., Ltd.**, Gyeonggi-do (KR)

(72) Inventors: **Hyun-Chul Choi**, Seoul (KR); **Moo-Young Kim**, Seoul (KR); **Chi-Hyun Cho**, Gyeonngi-do (KR); **Chang-Ryong Heo**, Gyeonngi-do (KR)

(73) Assignee: **Samsung Electronics Co., Ltd**, Suwon-si (KR)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 0 days.

(21) Appl. No.: **14/268,942**

(22) Filed: **May 2, 2014**

(65) **Prior Publication Data**

US 2014/0329486 A1 Nov. 6, 2014

(30) **Foreign Application Priority Data**

May 2, 2013 (KR) 10-2013-0049588

(51) **Int. Cl.**
H04W 4/00 (2009.01)
H04W 4/22 (2009.01)

(52) **U.S. Cl.**
CPC ***H04W 4/008*** (2013.01); ***H04W 4/22*** (2013.01)

(58) **Field of Classification Search**
None
See application file for complete search history.

(56) **References Cited**

U.S. PATENT DOCUMENTS

2005/0057359	A1*	3/2005	Coffey et al.	340/539.21
2006/0040680	A1*	2/2006	Daurensan	455/457
2007/0239355	A1*	10/2007	Oh et al.	701/211
2008/0014869	A1*	1/2008	Demirbasa et al.	455/41.2
2010/0279647	A1*	11/2010	Jacobs et al.	455/404.1
2011/0063105	A1*	3/2011	Bennett et al.	340/539.11
2012/0295638	A1*	11/2012	Yamauchi	455/456.1
2014/0051379	A1*	2/2014	Ganesh et al.	455/404.1
2014/0197948	A1*	7/2014	Mo et al.	340/539.13

FOREIGN PATENT DOCUMENTS

KR 10-2005-0077195 8/2005

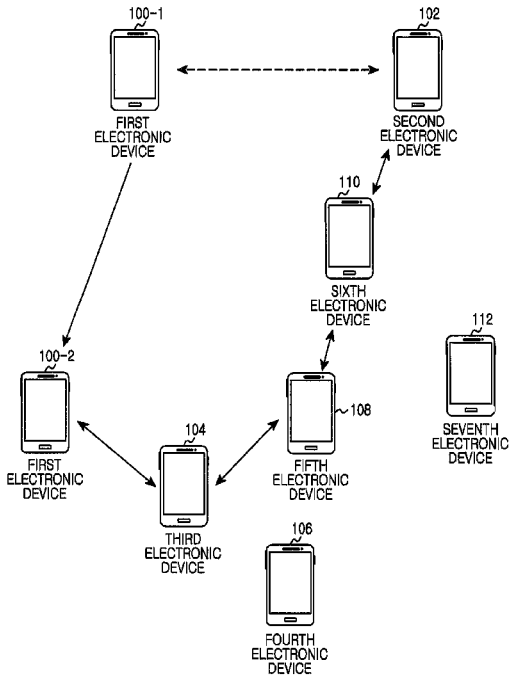
* cited by examiner

Primary Examiner — Kimberly A Williams

(57) **ABSTRACT**

A method and electronic device for transmitting an emergency signal. The method includes: establishing a short-range communication link with a counterpart electronic device using a first short-range communication network; generating an emergency signal when the short-range communication link with the counterpart electronic device is cut off; and broadcasting the emergency signal using a second short-range communication network.

22 Claims, 15 Drawing Sheets



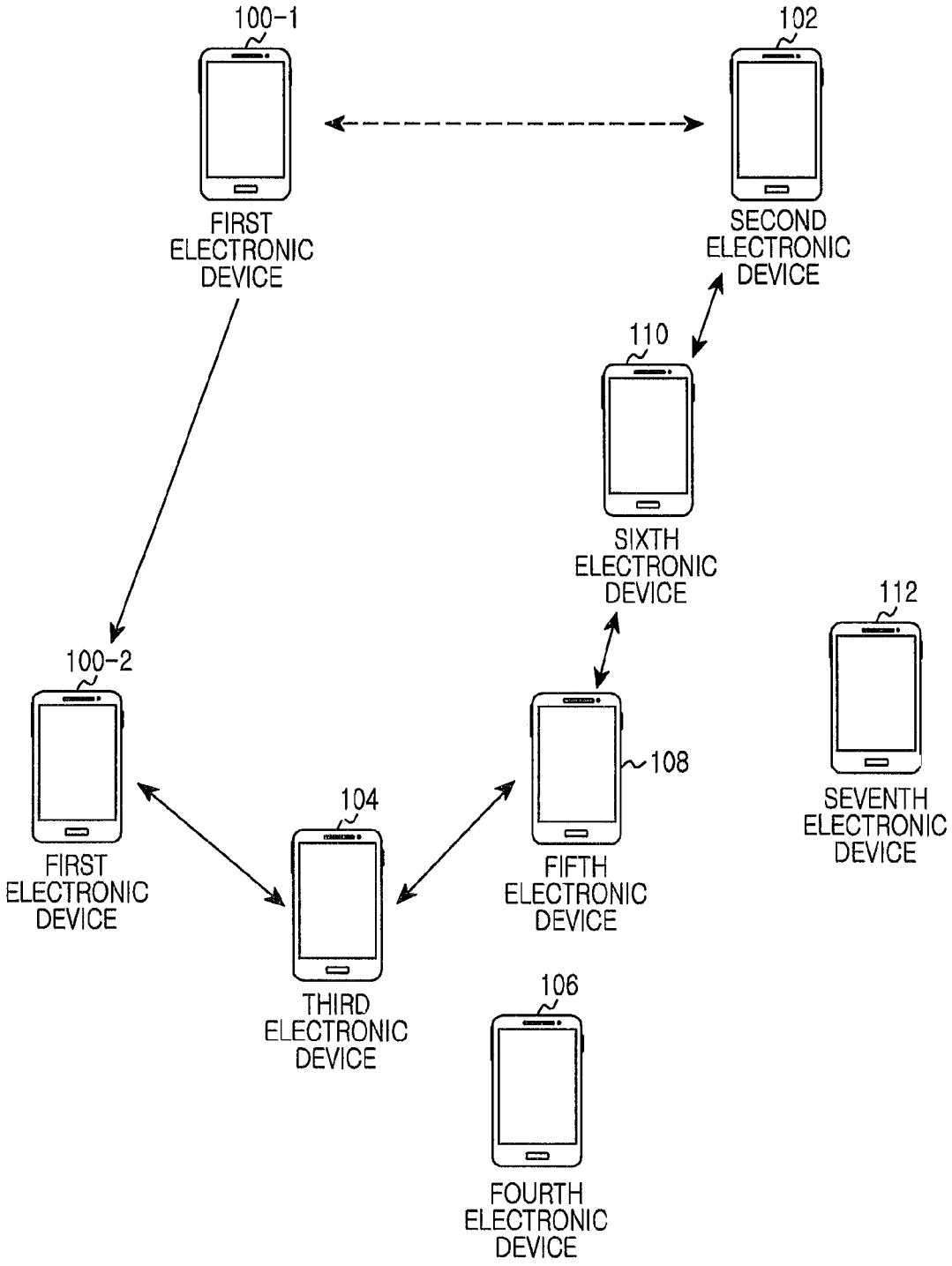

100-1
FIRST ELECTRONIC DEVICE
102
SECOND ELECTRONIC DEVICE
110
SIXTH ELECTRONIC DEVICE
112
SEVENTH ELECTRONIC DEVICE
100-2
FIRST ELECTRONIC DEVICE
104
THIRD ELECTRONIC DEVICE
108
FIFTH ELECTRONIC DEVICE
106
FOURTH ELECTRONIC DEVICE

FIG.1

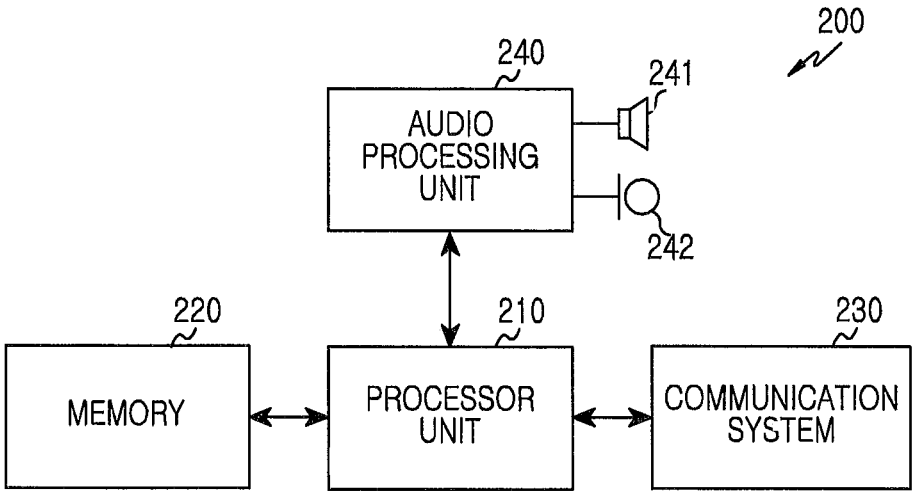

200
240
241
AUDIO PROCESSING UNIT
242
220
210
230
MEMORY
PROCESSOR UNIT
COMMUNICATION SYSTEM

FIG.2

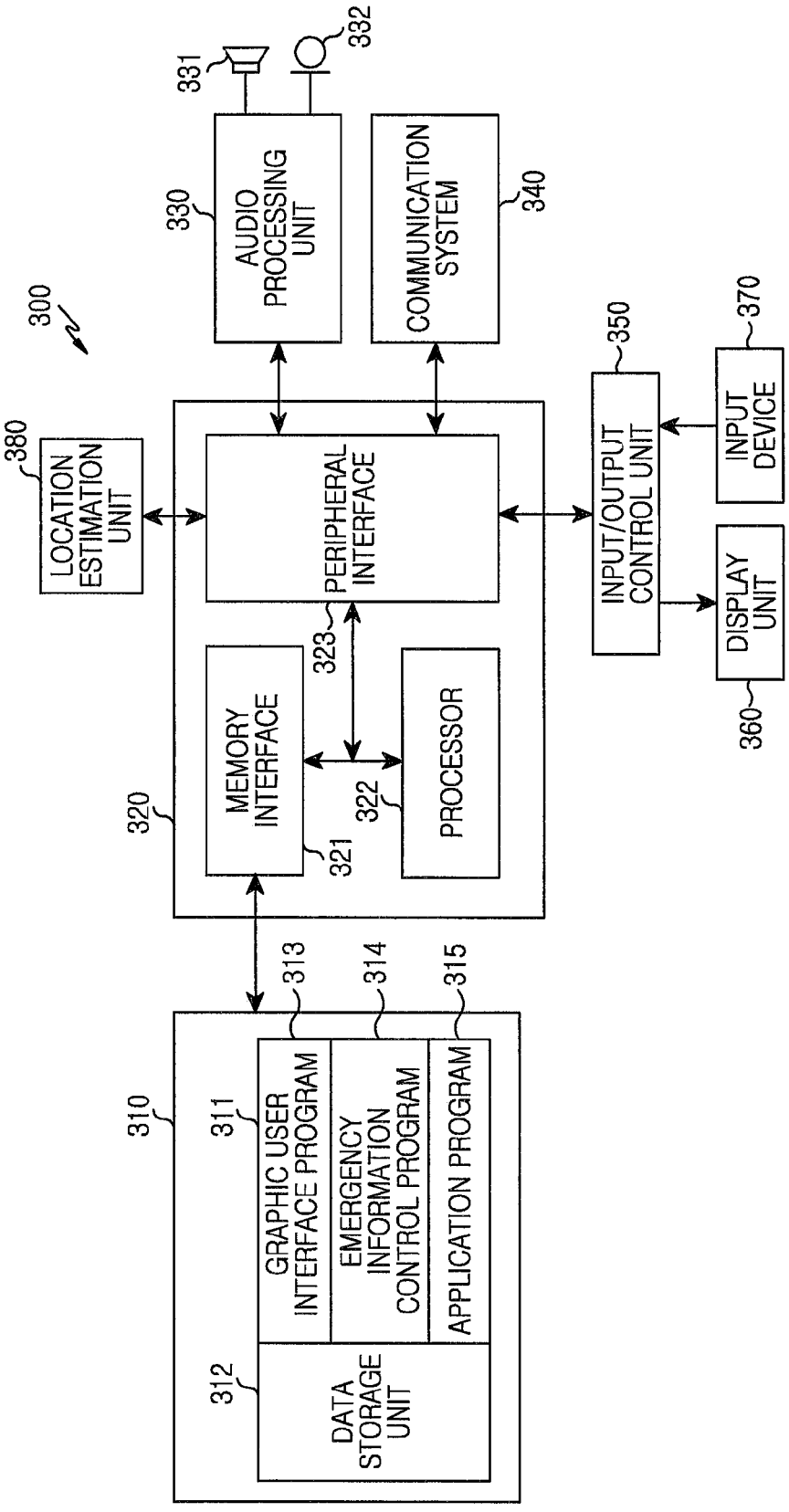

300
310
311
GRAPHIC USER INTERFACE PROGRAM
EMERGENCY INFORMATION CONTROL PROGRAM
APPLICATION PROGRAM
312
DATA STORAGE UNIT
313
314
315
320
MEMORY INTERFACE
321
322
PROCESSOR
323
PERIPHERAL INTERFACE
330
AUDIO PROCESSING UNIT
331
332
340
COMMUNICATION SYSTEM
350
INPUT/OUTPUT CONTROL UNIT
360
DISPLAY UNIT
370
INPUT DEVICE
380
LOCATION ESTIMATION UNIT

FIG.3

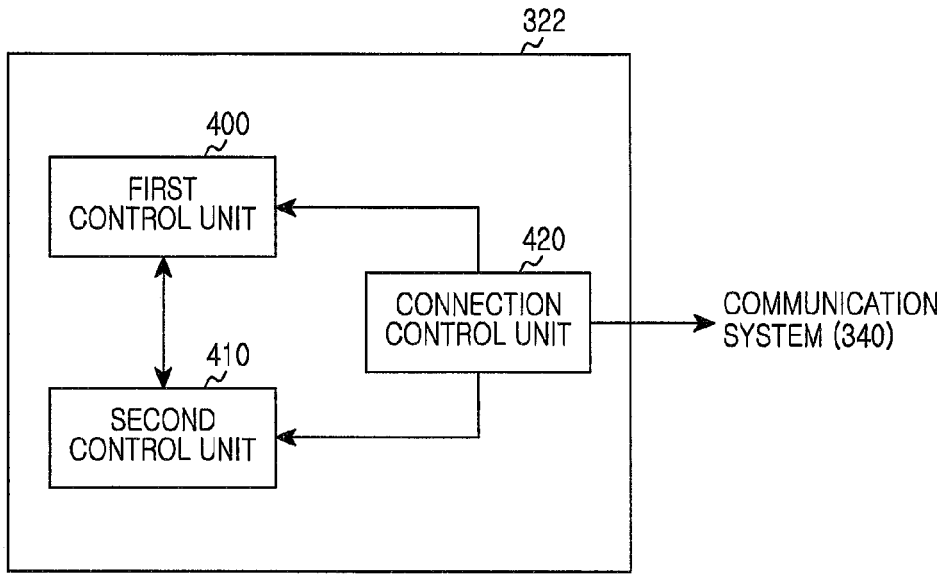

322
400
FIRST CONTROL UNIT
420
CONNECTION CONTROL UNIT
COMMUNICATION SYSTEM (340)
410
SECOND CONTROL UNIT

FIG.4

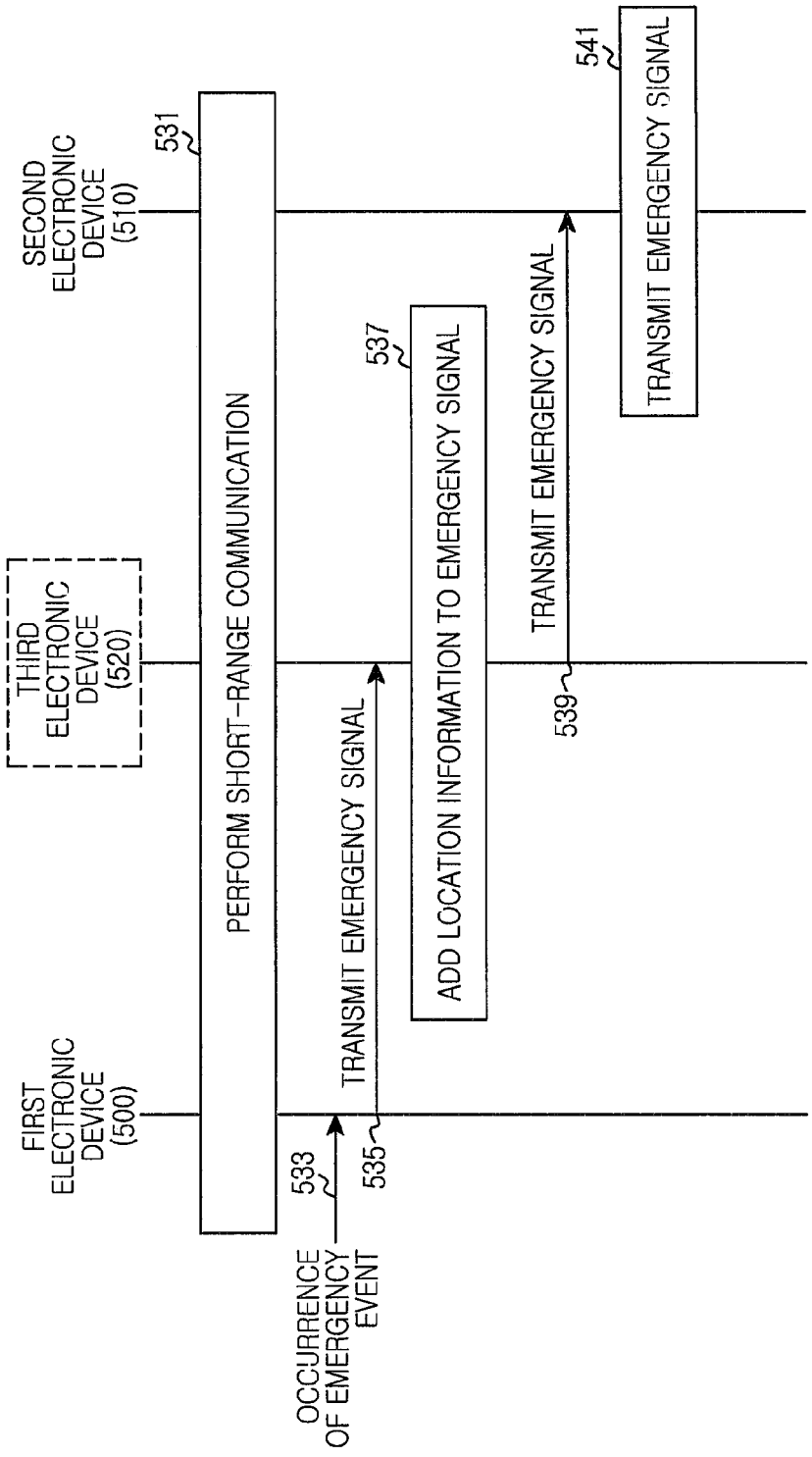

FIRST ELECTRONIC DEVICE (500)
THIRD ELECTRONIC DEVICE (520)
SECOND ELECTRONIC DEVICE (510)
OCCURRENCE OF EMERGENCY EVENT
533
PERFORM SHORT-RANGE COMMUNICATION
531
TRANSMIT EMERGENCY SIGNAL
535
ADD LOCATION INFORMATION TO EMERGENCY SIGNAL
537
TRANSMIT EMERGENCY SIGNAL
539
TRANSMIT EMERGENCY SIGNAL
541

FIG.5

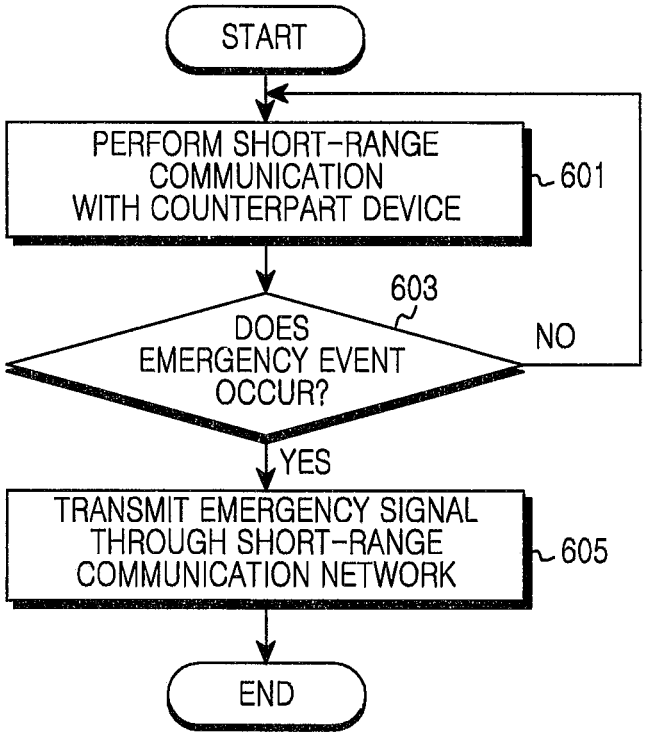

START
PERFORM SHORT-RANGE COMMUNICATION WITH COUNTERPART DEVICE
601
603
DOES EMERGENCY EVENT OCCUR?
NO
YES
TRANSMIT EMERGENCY SIGNAL THROUGH SHORT-RANGE COMMUNICATION NETWORK
605
END

FIG.6

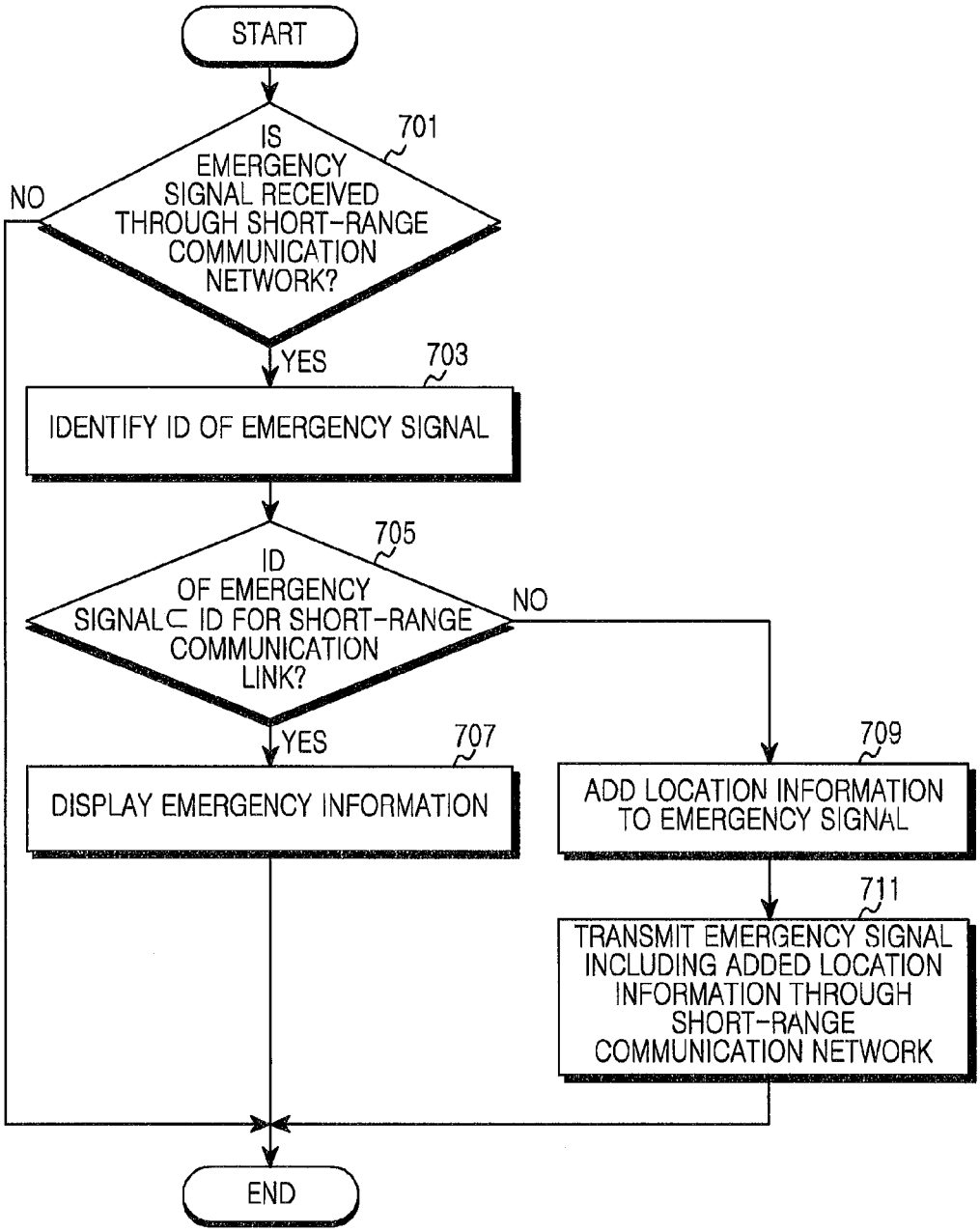

START
IS EMERGENCY SIGNAL RECEIVED THROUGH SHORT-RANGE COMMUNICATION NETWORK?
701
NO
YES
IDENTIFY ID OF EMERGENCY SIGNAL
703
ID OF EMERGENCY SIGNAL⊂ ID FOR SHORT-RANGE COMMUNICATION LINK?
705
NO
YES
DISPLAY EMERGENCY INFORMATION
707
ADD LOCATION INFORMATION TO EMERGENCY SIGNAL
709
TRANSMIT EMERGENCY SIGNAL INCLUDING ADDED LOCATION INFORMATION THROUGH SHORT-RANGE COMMUNICATION NETWORK
711
END

FIG.7

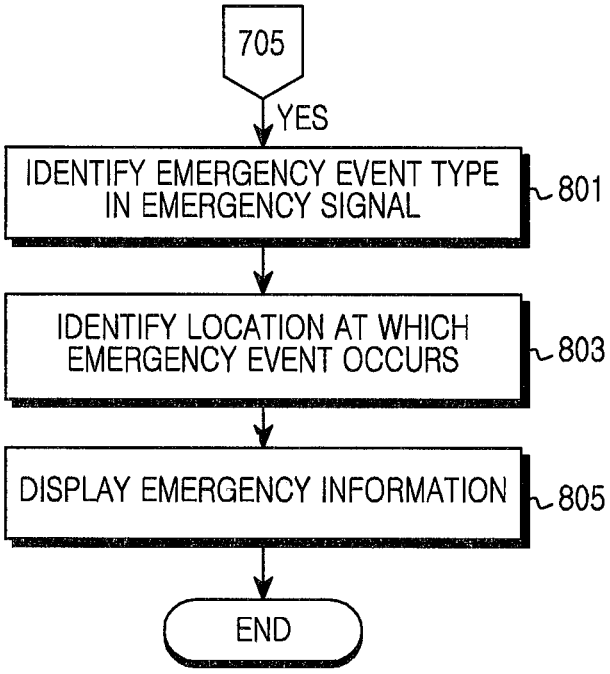

705
YES
IDENTIFY EMERGENCY EVENT TYPE IN EMERGENCY SIGNAL
801
IDENTIFY LOCATION AT WHICH EMERGENCY EVENT OCCURS
803
DISPLAY EMERGENCY INFORMATION
805
END

FIG.8

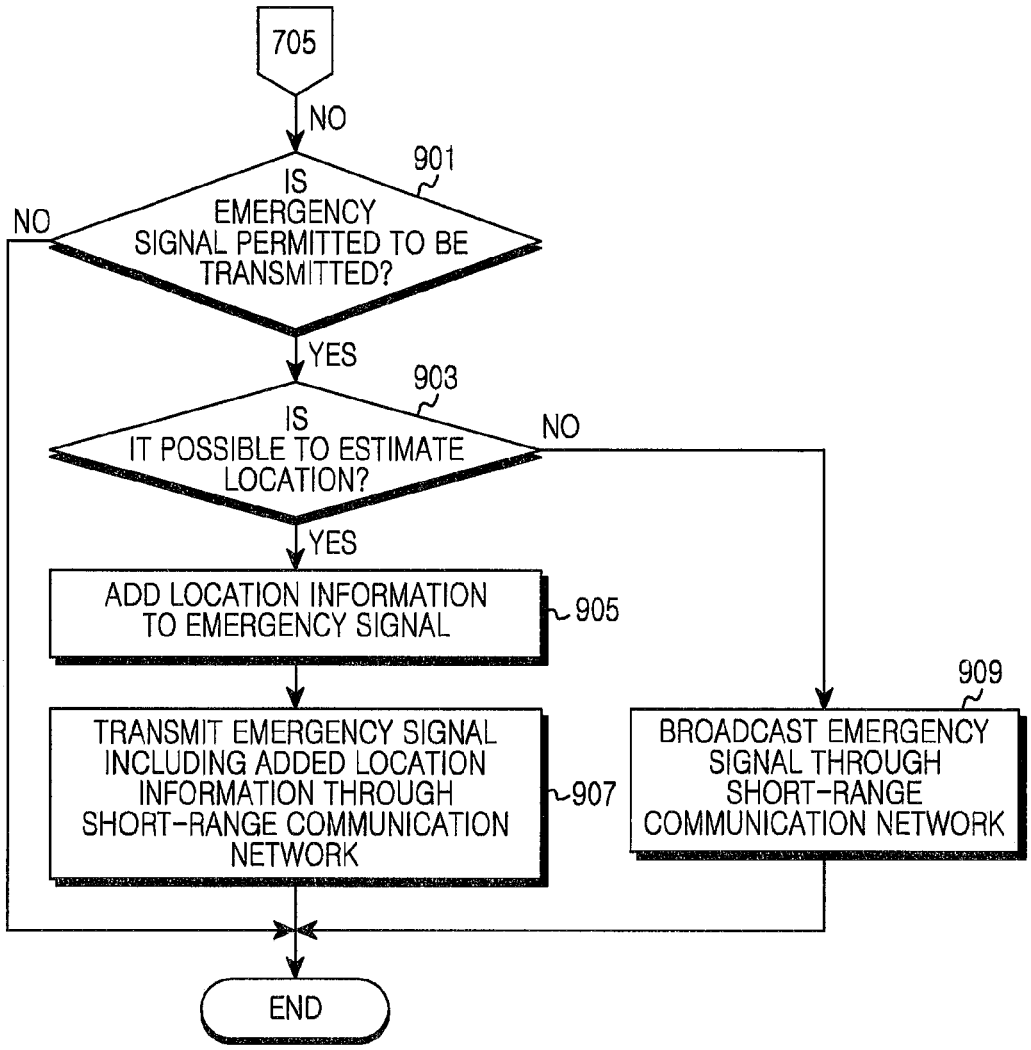

705
NO
901
IS EMERGENCY SIGNAL PERMITTED TO BE TRANSMITTED?
NO
YES
903
IS IT POSSIBLE TO ESTIMATE LOCATION?
NO
YES
ADD LOCATION INFORMATION TO EMERGENCY SIGNAL
905
TRANSMIT EMERGENCY SIGNAL INCLUDING ADDED LOCATION INFORMATION THROUGH SHORT-RANGE COMMUNICATION NETWORK
907
909
BROADCAST EMERGENCY SIGNAL THROUGH SHORT-RANGE COMMUNICATION NETWORK
END

FIG.9

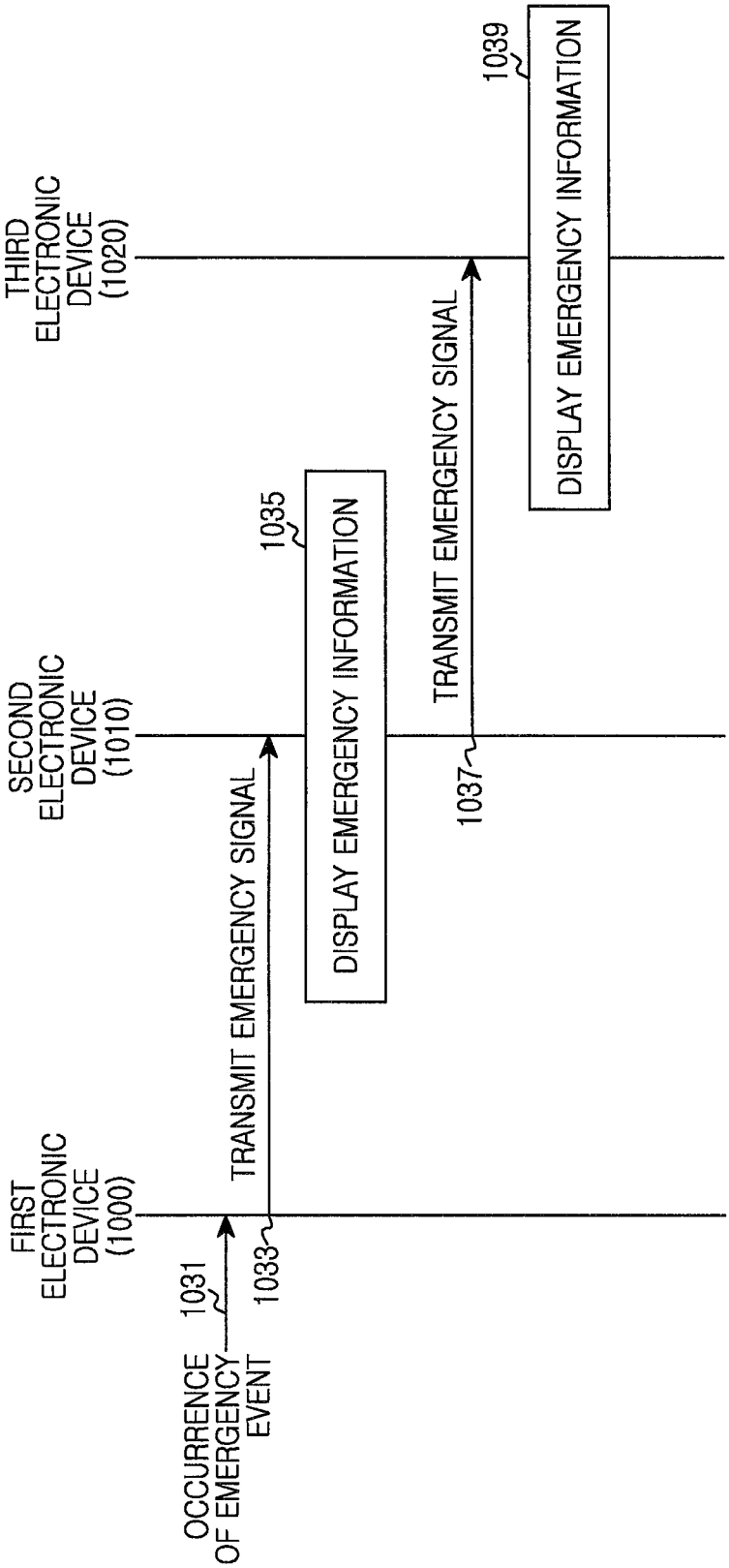

FIRST ELECTRONIC DEVICE (1000)
SECOND ELECTRONIC DEVICE (1010)
THIRD ELECTRONIC DEVICE (1020)
OCCURRENCE OF EMERGENCY EVENT
1031
1033
TRANSMIT EMERGENCY SIGNAL
1035
DISPLAY EMERGENCY INFORMATION
1037
TRANSMIT EMERGENCY SIGNAL
1039
DISPLAY EMERGENCY INFORMATION

FIG. 10

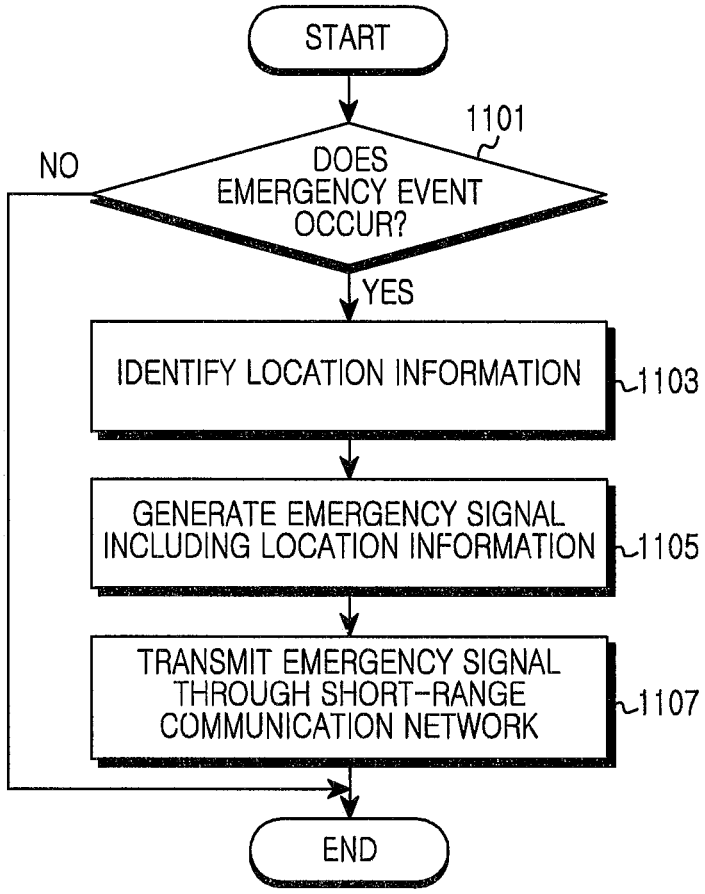

START
1101
DOES EMERGENCY EVENT OCCUR?
NO
YES
IDENTIFY LOCATION INFORMATION
1103
GENERATE EMERGENCY SIGNAL INCLUDING LOCATION INFORMATION
1105
TRANSMIT EMERGENCY SIGNAL THROUGH SHORT-RANGE COMMUNICATION NETWORK
1107
END

FIG.11

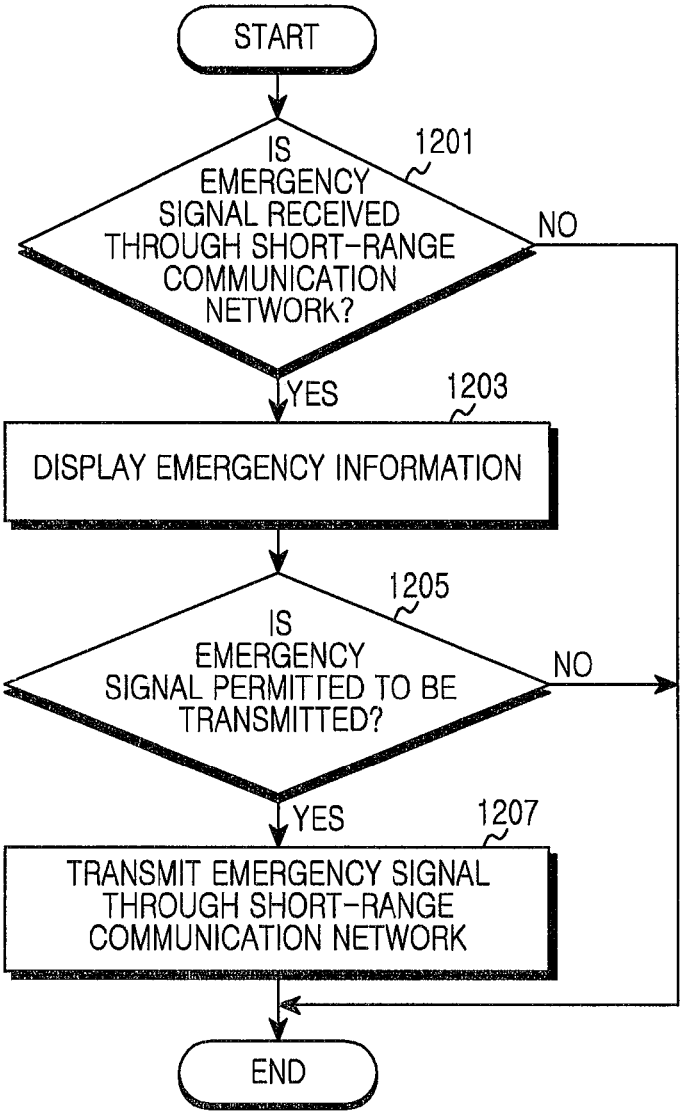

START
IS EMERGENCY SIGNAL RECEIVED THROUGH SHORT-RANGE COMMUNICATION NETWORK?
1201
NO
YES
1203
DISPLAY EMERGENCY INFORMATION
IS EMERGENCY SIGNAL PERMITTED TO BE TRANSMITTED?
1205
NO
YES
1207
TRANSMIT EMERGENCY SIGNAL THROUGH SHORT-RANGE COMMUNICATION NETWORK
END

FIG.12

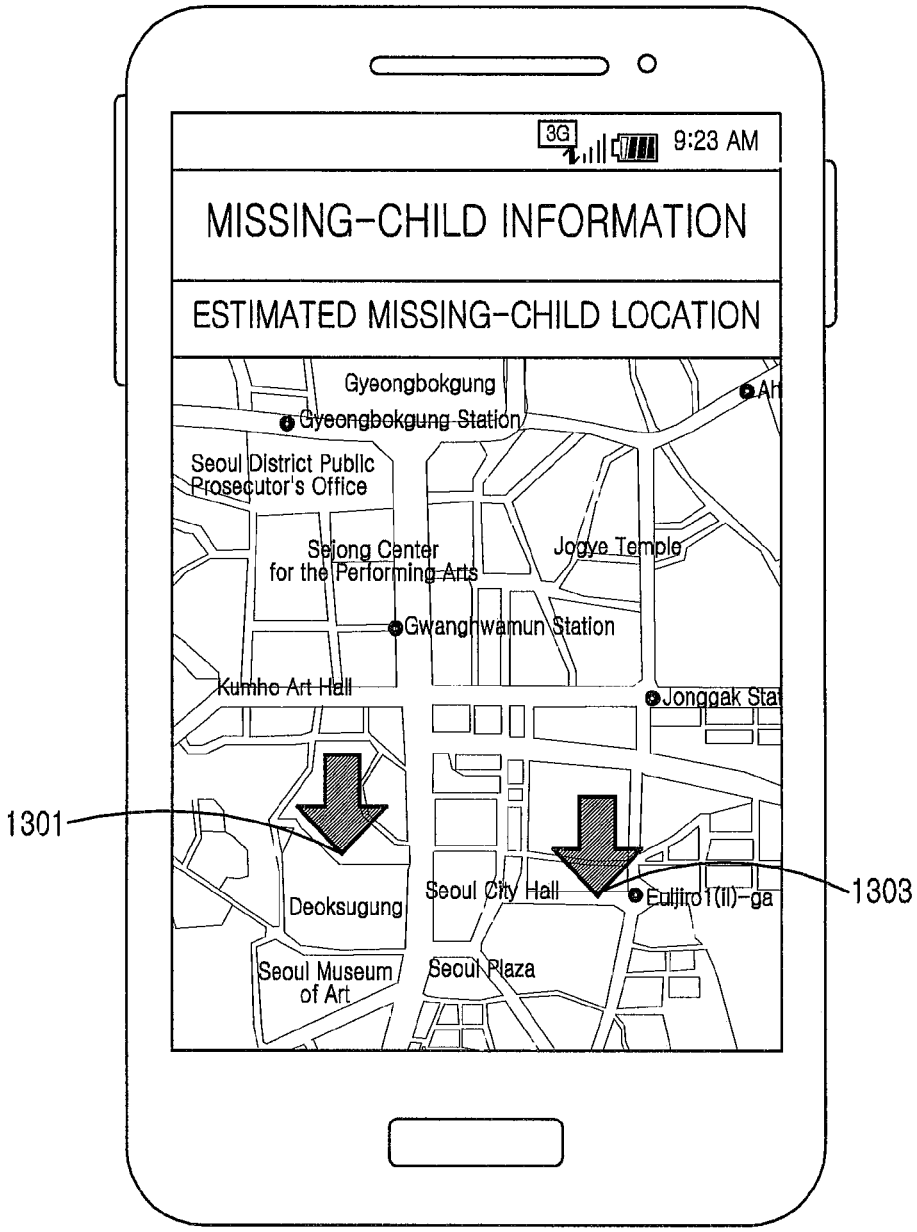

3G
9:23 AM
MISSING-CHILD INFORMATION
ESTIMATED MISSING-CHILD LOCATION
Gyeongbokgung
Gyeongbokgung Station
Seoul District Public Prosecutor's Office
Sejong Center for the Performing Arts
Jogye Temple
Gwanghwamun Station
Kumho Art Hall
Jonggak Stat
Deoksugung
Seoul City Hall
Euljiro1(il)-ga
Seoul Museum of Art
Seoul Plaza
1301
1303

FIG.13A

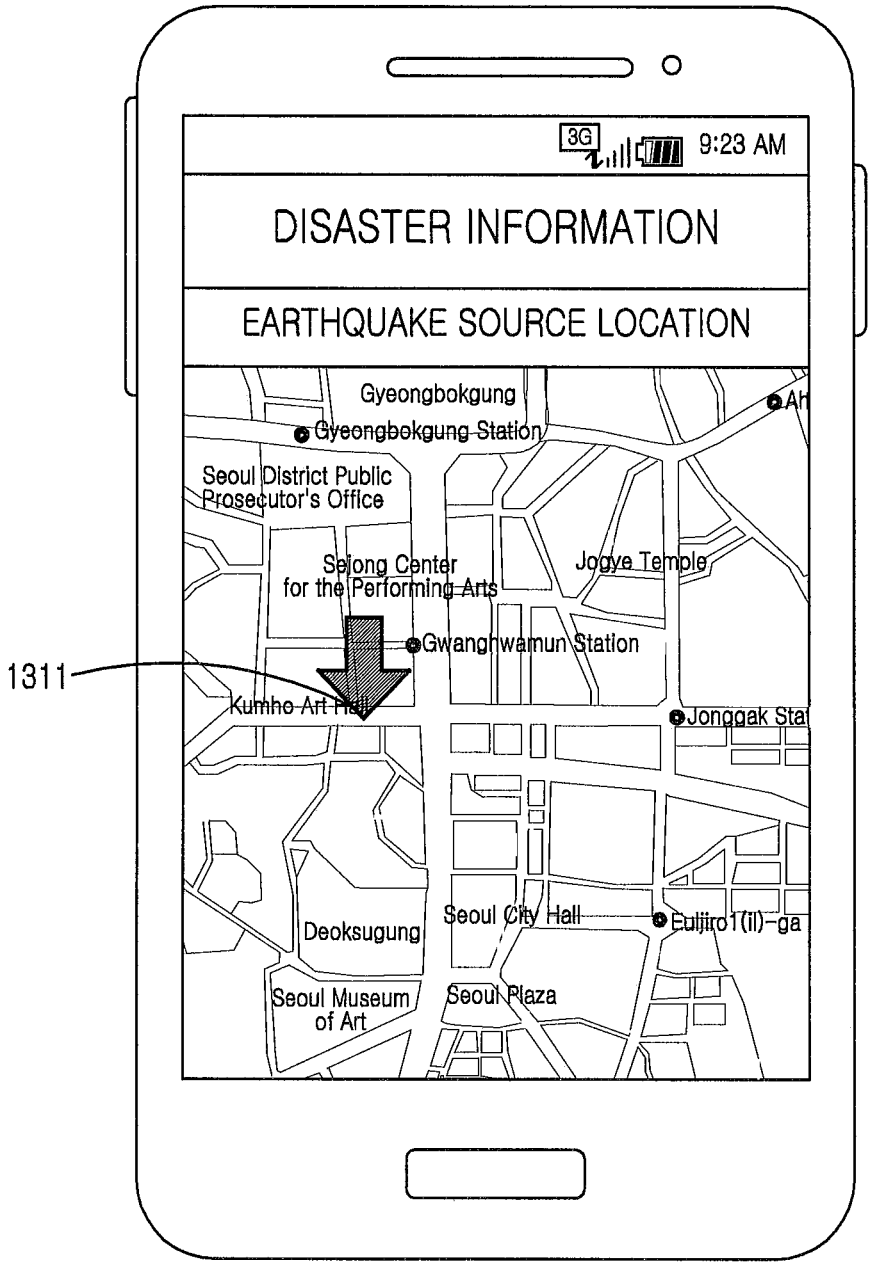

3G
9:23 AM
DISASTER INFORMATION
EARTHQUAKE SOURCE LOCATION
Gyeongbokgung
Gyeongbokgung Station
Seoul District Public Prosecutor's Office
Sejong Center for the Performing Arts
Jogye Temple
Gwanghwamun Station
Kumho Art Hall
Jonggak Sta
Deoksugung
Seoul City Hall
Euljiro1(il)-ga
Seoul Museum of Art
Seoul Plaza
1311

FIG.13B

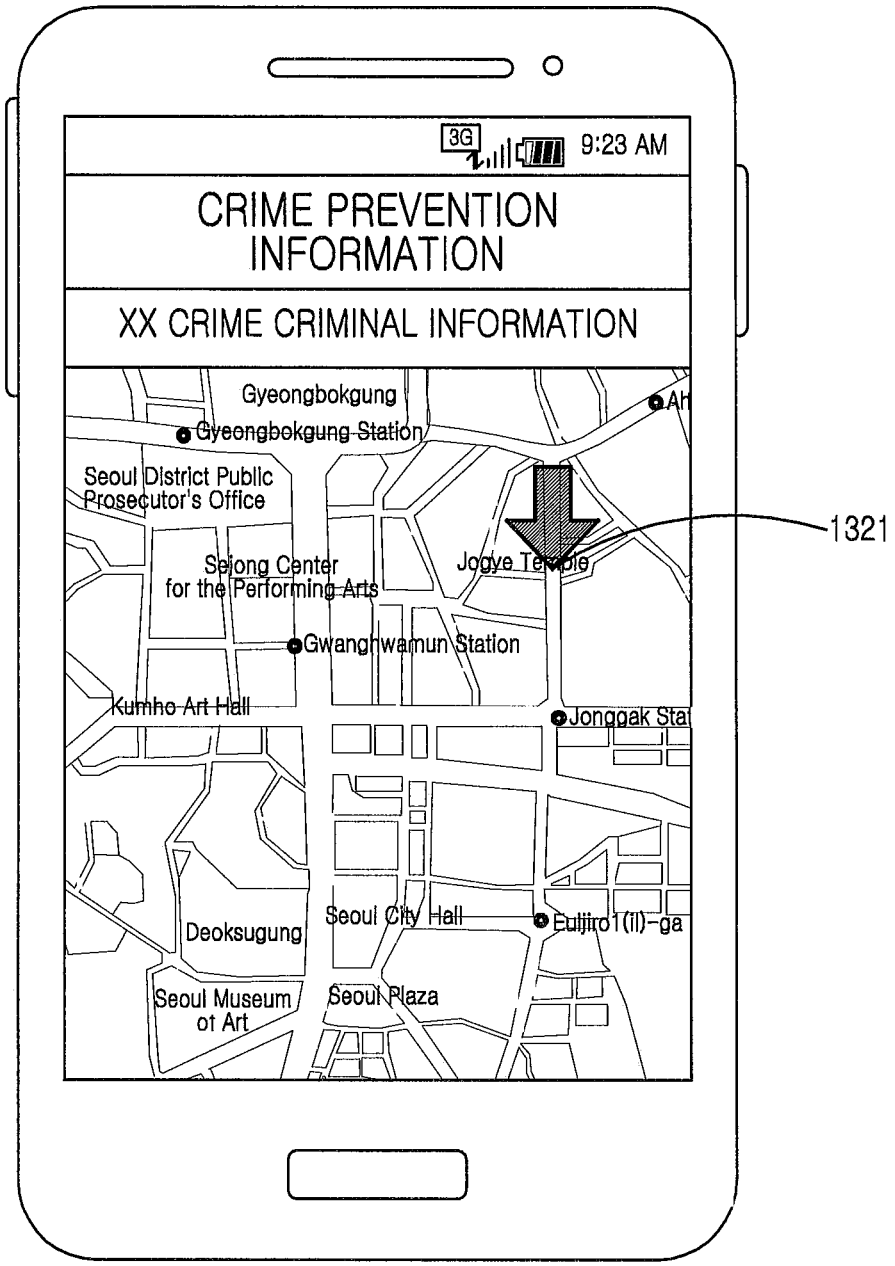

3G
9:23 AM
CRIME PREVENTION INFORMATION
XX CRIME CRIMINAL INFORMATION
Gyeongbokgung
Gyeongbokgung Station
Seoul District Public Prosecutor's Office
Sejong Center for the Performing Arts
Jogye Temple
Gwanghwamun Station
Kumho Art Hall
Jonggak Sta
Deoksugung
Seoul City Hall
Euljiro1(il)-ga
Seoul Museum ot Art
Seoul Plaza
1321

FIG.13C

METHOD FOR TRANSMITTING SIGNAL USING SHORT RANGE COMMUNICATION AND ELECTRONIC DEVICE THEREOF

PRIORITY

The present application is related to and claims priority under 35 U.S.C. §119 to an application filed in the Korean Intellectual Property Office on May 2, 2013 and assigned Serial No. 10-2013-0049588, the contents of which are incorporated herein by reference.

TECHNICAL FIELD

The present disclosure relates generally to a method for transmitting a signal and an electronic device thereof.

BACKGROUND

As the number of users of portable electronic devices increases due to their portability and provision of various multimedia services, it is possible to provide a service of transmitting emergency information, such as missing-child information or disaster information, using the portable electronic devices.

In a case where an emergency information transmission service is provided using the portable electronic devices, when the emergency information is transmitted with respect to a widespread region at one time, the user of a portable electronic device that receives the emergency signal may not recognize how a location at which the user is located is associated with the emergency information. Accordingly, there is a need for a method for providing emergency information in consideration of a location of a portable electronic device.

SUMMARY

To address the above-discussed deficiencies, it is a primary object to provide an apparatus and method for transmitting emergency information in an electronic device.

Another object of the present disclosure is to provide an apparatus and method for transmitting emergency information using short range communication in an electronic device.

Another object of the present disclosure is to provide an apparatus and method for transmitting emergency information using short range communication in an electronic device having no GPS module.

Another object of the present disclosure is to provide an apparatus and method for relaying emergency information using short range communication in an electronic device.

Another object of the present disclosure is to provide an apparatus and method for relaying emergency information using short range communication in an electronic device which is in a sleep mode.

Another object of the present disclosure is to provide an apparatus and method for transmitting emergency information using short range communication in an electronic device which supports only short range communication.

Another object of the present disclosure is to provide an apparatus and method for relaying emergency information without exposing the emergency information to a user according to emergency information types in an electronic device.

According to an aspect of the present disclosure, a method for transmitting an emergency signal in an electronic device includes: establishing a short-range communication link with another electronic device (ex. counterpart electronic device) using a first short-range communication network; generating an emergency signal when the short-range communication link with the other electronic device is disconnected; and broadcasting the emergency signal using a second short-range communication network.

The short-range communication link ID may include identification information generated by applying a random number to unique identification information for at least one electronic device of the electronic device or the counterpart electronic device, and the unique identification information may include at least one of a MAC address, a mobile equipment ID (MEID), an International Mobile Equipment Identity (IMEI) or a telephone number.

The first short-range communication network and the second short-range communication network may be identical to or different from each other, and the near-field communication network may include at least one of infrared wireless communication, Bluetooth communication, Zigbee communication, or wireless LAN communication.

According to another aspect of the present disclosure, a method for receiving an emergency signal in an electronic device includes: receiving an emergency signal through a short-range communication network; determining whether the electronic device is a destination of the emergency signal; identifying one or more of an emergency situation type and emergency situation location information included in the emergency signal when the electronic device is the destination of the emergency signal; and displaying one or more of the emergency situation type and the emergency situation location information.

According to another aspect of the present disclosure, an electronic device includes at least one short-range communication unit; and at least one processor, wherein the processor establishes a short-range communication link with another electronic device (ex. counterpart electronic device) using a first short-range communication network through the short-range communication unit, generates an emergency signal when the short-range communication link with the other electronic device is disconnected, and broadcasts the emergency signal using a second short-range communication network through the short-range communication unit.

The short-range communication link ID may include identification information generated by applying a random number to unique identification information for at least one electronic device of the electronic device or the other electronic device, and the unique identification information may include at least one of a MAC address, a mobile equipment ID (MEID), an International Mobile Equipment Identity (IMEI) or a telephone number.

The first short-range communication network and the second short-range communication network may be identical to or different from each other, and the near-field communication network may include at least one of infrared wireless communication, Bluetooth communication, Zigbee communication, or wireless LAN communication.

According to another aspect of the present disclosure, an electronic device includes: a display unit; at least one short-range communication unit; and at least one processor, wherein the processor receives an emergency signal through the short-range communication unit, determines whether the electronic device is a destination of the emergency signal, identifies one or more of an emergency situation type or emergency situation location information included in the emergency signal when the electronic device is the destination of the emergency signal, and displays one or more of the

emergency situation type or the emergency situation location information on the display unit.

Before undertaking the DETAILED DESCRIPTION below, it may be advantageous to set forth definitions of certain words and phrases used throughout this patent document: the terms "include" and "comprise," as well as derivatives thereof, mean inclusion without limitation; the term "or," is inclusive, meaning and/or; the phrases "associated with" and "associated therewith," as well as derivatives thereof, may mean to include, be included within, interconnect with, contain, be contained within, connect to or with, couple to or with, be communicable with, cooperate with, interleave, juxtapose, be proximate to, be bound to or with, have, have a property of, or the like; and the term "controller" means any device, system or part thereof that controls at least one operation, such a device may be implemented in hardware, firmware or software, or some combination of at least two of the same. It should be noted that the functionality associated with any particular controller may be centralized or distributed, whether locally or remotely. Definitions for certain words and phrases are provided throughout this patent document, those of ordinary skill in the art should understand that in many, if not most instances, such definitions apply to prior, as well as future uses of such defined words and phrases.

BRIEF DESCRIPTION OF THE DRAWINGS

For a more complete understanding of the present disclosure and its advantages, reference is now made to the following description taken in conjunction with the accompanying drawings, in which like reference numerals represent like parts:

FIG. **1** illustrates a configuration for transmitting position information of a missing child using short-range communication according to an embodiment of the present disclosure;

FIG. **2** illustrates a block diagram of an electronic device according to an embodiment of the present disclosure;

FIG. **3** illustrates a detailed block diagram of a processor according to an embodiment of the present disclosure;

FIG. **4** illustrates a block diagram of an electronic device according to an embodiment of the present disclosure;

FIG. **5** illustrates a flowchart for a process of transmitting location information of a missing child using short-range communication according to an embodiment of the present disclosure;

FIG. **6** illustrates a flowchart for a process of transmitting a missing-child occurrence signal using short-range communication in an electronic device according to an embodiment of the present disclosure;

FIG. **7** illustrates a flowchart for a process of identifying missing-child location information using short-range communication in an electronic device according to an embodiment of the present disclosure;

FIG. **8** illustrates a flowchart for a process for displaying missing-child location information in an electronic device according to an embodiment of the present disclosure;

FIG. **9** illustrates a flowchart for a process for relaying missing-child location information in an electronic device according to an embodiment of the present disclosure;

FIG. **10** illustrates a flowchart for a process of transmitting emergency information using short-range communication according to an embodiment of the present disclosure;

FIG. **11** illustrates a flowchart for a process of transmitting emergency information using short-range communication in an electronic device according to an embodiment of the present disclosure;

FIG. **12** illustrates a flowchart for a process of identifying emergency information using short-range communication in an electronic device according to an embodiment of the present disclosure; and

FIGS. **13**A to **13**C illustrate screen configurations of displaying emergency information in an electronic device according to an embodiment of the present disclosure.

DETAILED DESCRIPTION

FIGS. **1** through **13**C, discussed below, and the various embodiments used to describe the principles of the present disclosure in this patent document are by way of illustration only and should not be construed in any way to limit the scope of the disclosure. Those skilled in the art will understand that the principles of the present disclosure may be implemented in any suitably arranged system or device. Exemplary embodiments of the present disclosure will be described herein below with reference to the accompanying drawings so that those skilled in the art can easily embody the present disclosure. In the following description of the exemplary embodiments, detailed descriptions of well-known functions or configurations will be omitted since they would unnecessarily obscure the subject matters of the present disclosure. Furthermore, terms to be described below have been defined by considering functions in embodiments of the present disclosure, and may be defined differently depending on a user or operator's intention or practice. Therefore, the definitions of such terms are based on the descriptions of the entire present specification.

Embodiments of the present disclosure provide technology of transmitting emergency information through a short-range communication network.

In embodiments of the present disclosure, the electronic device may be one or more of a portable electronic device, a portable terminal, a mobile terminal, a mobile pad, a media player, a personal digital assistant (PDA), a desktop computer, a laptop computer, a smart phone, a netbook computer, a television, a mobile Internet device (MID), an ultra mobile PC (UMPC), a tablet PC, a navigation, or an MPEG Audio Layer-3 (MP3) player. In addition, the electronic device may be any one electronic device in which the functions of two or more devices among the above-described devices are integrated.

The present disclosure relates to a method for transmitting emergency information through a short-range communication network and an electronic device thereof.

FIG. **1** illustrates a configuration for transmitting position information of a missing child using short-range communication according to an embodiment of the present disclosure.

Referring to FIG. **1**, a first electronic device **100-1** carried by a child and a second electronic device **102** carried by a parent may establish a short-range communication link according to a first short-range communication method for missing child prevention. In this case, the first electronic device **100-1** and the second electronic device **102** may generate and store an alert identifier (ID) for the short-range communication link for identifying the near-field communication link. For example, the first electronic device **100-1** and the second electronic device **102** may generate the alert ID for the short-range communication link by applying a random number to the unique identification information of at least one of the first electronic device **100-1** or the second electronic device **102**. That is, the first electronic device **100-1** and the second electronic device **102** may prevent the unique identification information of the first electronic device **100-1** and the second electronic device **102** from being exposed to the

outside by using the random number when transmitting a missing-child occurrence alert message using the short-range communication. Alternatively, the first electronic device **100** and the second electronic device **102** may set the unique identification information of their counterpart electronic devices as the alert ID for the short-range communication link. In this case, the unique identification information may include at least one of a MAC address, a mobile equipment identifier (MEID), an international mobile equipment identity (IMEI), or a telephone number of an electronic device.

When the first electronic device **100-1** is out of a first short-range communication range with the second electronic device **102** due to the movement (**100-1**→**100-2**) of the first electronic device **100-1**, the first electronic device **100-2** may broadcast the missing-child occurrence alert message including the alert ID for the short-range communication link with the second electronic device **102** to neighboring devices included in a second short-range communication range by using second short-range communication. That is, the first electronic device **100-2** may broadcast an emergency signal including the alert ID for the short-range communication link with the second electronic device **102** and missing-child occurrence information to the neighboring devices by using the second short-range communication. For example, when the strength of a signal from the second electronic device **102** according to the first short-range communication method is equal to or lower than a reference strength, the first electronic device **100-2** may recognize that the first electronic device **100-2** is out of the first short-range communication range with the second electronic device **102**. As another example, when the strength of a signal from the second electronic device **102** according to the first short-range communication method is equal to or lower than the reference strength for a reference time, the first electronic device **100-2** may recognize that the first electronic device **100-2** is out of the first short-range communication range with the second electronic device **102**. The first short-range communication may be identical to or different from the second short-range communication. The missing-child occurrence alert message may include at least one of a packet ID, an alert ID, a public flag, an emergency situation type, time information, position information, a delivery count, or a delivery time.

Electronic devices **104**, **106**, **108**, **110** and **112** located between the first electronic device **100-2** and the second electronic device **102** may relay the missing-child occurrence alert message broadcast by the first electronic device **100-2** through the second short-range communication network to the second electronic device **102**. For example, the electronic devices **104**, **108** and **110** which had received the missing-child occurrence alert message broadcast by the first electronic device **100-2** through the second short-range communication network may again broadcast the missing-child occurrence alert message through the second short-range communication network. In this case, the electronic devices **104**, **108** and **110** may determine whether the destination of the missing-child occurrence alert message is directed to the electronic devices **104**, **108** and **110** themselves based on the alert ID included in the missing-child occurrence alert message. When the first electronic device **100-2** and the second electronic device **102** generate the alert ID by using a random number, the electronic devices **104**, **108** and **110** may not identify the unique identification information of the first electronic device **100-2** and the second electronic device **102** based on the alert ID included in the missing-child occurrence alert message.

As described above, when the missing-child occurrence alert message is broadcast, the electronic devices **104**, **108** and **110** may add the position information of the electronic devices themselves to the missing-child occurrence alert message. For example, when the missing-child occurrence alert message received through the second short-range communication network does not include position information, the third electronic device **104** may add the position information of the third electronic device **104** to the missing-child occurrence alert message and broadcast the same through the second short-range communication network.

When receiving the missing-child occurrence alert message broadcast by the sixth electronic device **110** through the second short-range communication network, the second electronic device **102** may identify the missing-child occurrence alert message for the first electronic device **100-2** based on the alert ID of the missing-child occurrence alert message. In this case, the second electronic device **102** may display missing-child occurrence information for the first electronic device **100** together with the position information included in the missing-child occurrence alert message on a display unit. Additionally, the second electronic device **102** may generate a missing-child occurrence alert sound.

As described above, the first electronic device **100** is for missing-child prevention and may be configured as illustrated in FIG. **2** so as to support a missing-child prevention function.

FIG. **2** illustrates a block diagram of an electronic device according to an exemplary embodiment of the present disclosure.

Referring to FIG. **2**, the electronic device **200** may include a processor unit **210**, a memory **220**, and a communication system **230**.

The memory **220** may include a program storage unit for storing a program for controlling an operation of the electronic device **200**, and a data storage unit for storing data generated during the execution of a program. For example, the program storage unit may include a communication control program and an emergency information generation program.

The communication control program includes at least one software component for performing control to perform short-range communication with a counterpart electronic device through the communication system **230**. For example, the communication control program may perform control to establish a short-range communication link with the counterpart electronic device through the communication system **230**. In this case, the communication control program may generate an alert ID for identifying the short-range communication link with the counterpart electronic device. For example, the communication control program may generate the alert ID for the short-range communication link by applying a random number to the unique identification information of at least one electronic device of the electronic device **200** and the counterpart electronic device. As another example, the communication control program may set the unique identification information of the counterpart electronic device, with which the short-range communication link is established, as the alert ID. In this case, the unique identification information may include at least one of a MAC address, a MEID, an IMEI or a telephone number.

The communication control program may perform control to broadcast a missing-child occurrence alert message generated through the emergency information generation program toward the near-field communication area via the short-range communication network when the electronic device **200** is out of a short-range communication range with the counterpart electronic device. For example, when the strength of a signal from the counterpart electronic device through the short-range communication link is equal to or lower than a

reference strength, the communication control program may recognize that the electronic device **200** is out of the short-range communication range with the counterpart electronic device. As another example, when the strength of a signal from the counterpart electronic device through the short-range communication link is equal to or lower than the reference strength for a reference time, the communication control program may recognize that the electronic device **200** is out of the short-range communication range with the counterpart electronic device. In this case, the communication control program may perform control to transmit the missing-child occurrence alert message by using a near-field communication method equal to or different from the near-field communication method with the counterpart electronic device.

In addition, the communication control program may control to again transmit the missing-child occurrence alert message. For example, when a response signal is not received in response to the missing-child occurrence alert message after the missing-child occurrence alert message is broadcast through the short-range communication network, the communication control program may perform control to retransmit the missing-child occurrence alert message. In this case, the communication control program may transmit the missing-child occurrence alert message repeatedly until the number of times of transmission reaches a reference number.

The emergency information generation program includes at least one software component for generating an emergency signal. For example, when the electronic device **200** is out of the short-range communication range with the counterpart electronic device, the emergency information generation program may generate the emergency signal including variables as provided in Table 1 under the control of the communication control program.

TABLE 1

variables	description
packet ID	an unique number of packet (packet duplication prevention)
alert ID	an unique value indicating destination of packet
public flag	a flag indicating whether a packet is needed to be identified in an electronic device for relaying the packet
type	emergency situation type
create time	a time at which packet is initially transmitted (broadcast)
timestamp	a time at which a packet is transmitted in an electronic device (packet duplication prevention)
delivery number & Location	location information and information about electronic devices which add the location information
delivery count	the number of times of packet delivery
TTL (Time To Live)	a time for which a packet needs to be forwarded or the times of effective packet deliveries

The alert ID of Table 1 may be generated by the communication control program in order to identify the short-range communication link with the counterpart electronic device. For example, the alert ID may be generated by applying a random number to the unique identification information of at least one electronic device of electronic devices connected to each other through the short-range communication link. Accordingly, when the emergency signal is transmitted through the short-range communication, an electronic device that knows the random number used to generate the alert, ID only decodes the alert ID and identifies the emergency signal.

The public flag may be set according to emergency signal types. For example, when there is a need to inform electronic devices, which relay the emergency signal, of the content of the emergency signal, for example, disaster or crime prevention, the public flag may be set to an active mode such that the electronic devices which relay the emergency signal identify a relevant packet.

The emergency information generation program may generate a missing-child occurrence alert message of which the type of the emergency signal is set to "missing-child occurrence" when the electronic device **200** is out of the short-range communication range with the counterpart electronic device.

The data storage unit may include alert ID information for the short-range communication link established through the communication control program.

The processor unit **210** enables the electronic device **200** to provide various services using at least one software program. In this case, the processor **210** executes at least one program stored in the memory **220** and provides a service corresponding to the program. For example, the processor unit **210** may execute the communication control program stored in the memory **220** to perform short-range communication with the counterpart electronic device through the communication system **230**. The processor unit **210** may perform control to broadcast a missing-child occurrence alert message generated by executing the emergency information generation program through the short-range communication network when the electronic device **200** is out of a short-range communication range with the counterpart electronic device. In this case, the processor unit **210** may execute the emergency information generation program stored in the memory **220** to generate the missing-child occurrence alert message including at least one variable of the variables as in Table 1.

The communication system **230** transmits and receives a signal according to at least one short-range communication method. For example, the communication system **230** may support near-field wireless communication with the counterpart electronic device using at least one short-range communication method of infrared wireless communication, Bluetooth communication, Zigbee or wireless LAN communication.

In addition, the electronic device **200** may further include an audio processing unit **240** for providing an audio interface between a user and the electronic device **200** through a speaker **241** and a microphone **242**. For example, the audio processing unit **240** may generate an alert sound through the speaker **241** when the electronic device **200** is out of the short-range communication range with the counterpart electronic device, In addition, the audio processing unit **240** may collect surrounding information through the microphone **242** when the electronic device **200** is out of the short-range communication range with the counterpart electronic device.

FIG. **3** illustrates a block diagram of an electronic device according to another embodiment of the present disclosure.

Referring to FIG. **3**, the electronic device **300** includes a memory **310**, a processor unit **320**, an audio processing unit **330**, a communication system **340**, an input/output control unit **350**, a display unit **360**, an input device **370**, and a position estimation unit **380**. In this case, the memory **310** may be provided in plurality.

The memory **310** may include a program storage unit **311** for storing a program for controlling an operation of the electronic device **300**, and a data storage unit **312** for storing data generated during the execution of a program.

For example, the program storage unit **311** includes a Graphic User Interface (GUI) program **313**, an emergency information control program **314**, and at least one application program **315**. In this case, the programs stored in the program storage unit **311** may be expressed as an instruction set that is a collection of instructions.

The GUI program **313** may include at least one software component for providing a graphic user interface on a display unit **360**. For example, the GUI program **313** may perform control to display information about application programs executed by the processor **322** on the display unit **360**. As another example, the GUI program **313** may perform control to display emergency information and location information at which an emergency situation occurs which are identified by the emergency information control program **314** on the display unit **360** as illustrated in FIG. **13**A to FIG. **13**C.

The emergency information control program **314** may include at least one software component for controlling transmission and reception of the emergency signal through the communication system **340**. For example, when the emergency signal is received through the communication system **340**, the emergency information control program **314** may identify the destination of the emergency signal based on the alert ID of the emergency signal. In this case, the emergency information control program **314** may perform control to transmit a response signal for the emergency signal through the communication system **340**.

When the destination of the emergency signal is the electronic device **300**, the emergency information control program **314** may identify the type of an emergency situation and location information in which the emergency situation occurs which are included in the emergency signal.

When the destination of the emergency signal is not the electronic device **300**, the emergency information control program **314** may determine whether the emergency signal is permitted to be transmitted. For example, the emergency information control program **314** may determine whether the emergency signal is repeatedly received in consideration of the packet ID information and timestamp information of the emergency signal. When the emergency signal is repeatedly received, the emergency information control program **314** may determine not to transmit the emergency signal. As another example, the emergency information control program **314** may identify the validity of the emergency signal in consideration of the TTL information of the emergency signal. When the emergency signal is not valid, the emergency information control program **314** may determine not to transmit the emergency signal.

When the emergency signal is permitted to be transmitted, the emergency information control program **314** may perform control to broadcast the emergency signal toward the short-range communication area through the communication system **340**. That is, the emergency information control program **314** may relay the emergency signal through the communication system **340** in the short-range communication area. In this case, the emergency information control program **314** may add the location information of the electronic device **300** to the emergency signal. For example, when the emergency signal does not include the location information, the emergency information control program **314** may add the location information of the electronic device **300** which is estimated by the location estimation unit **380** to the emergency signal.

The emergency information control program **314** may perform control to establish a short-range communication link with a counterpart electronic device through the communication system **340**. In this case, the emergency information control program **314** may generate an alert ID for identifying the short-range communication link with the counterpart electronic device. For example, the emergency information control program **314** may generate the alert ID for the short-range communication link by applying a random number to the unique identification information of at least one electronic device of the electronic device **300** and the counterpart electronic device. As another example, the emergency information control program **314** may set the unique identification information of the counterpart electronic device, with which the short-range communication link is established, as the alert ID. In this case, the unique identification information may include at least one of a MAC address, a MEID, an IMEI or a telephone number.

The emergency information control program **314** may perform control to broadcast the emergency signal toward the short-range communication area by using the communication system **340** when an emergency event occurs. For example, the emergency information control program **314** may perform control to broadcast the emergency signal toward the short-range communication area by using the communication system **340** when an emergency signal generation menu is selected according to input information provided from the input device **370**. As another example, the emergency information control program **314** may perform control to broadcast the emergency signal toward the short-range communication area by using the communication system **340** when it is determined that the electronic device **300** is out of a limited movement area or enters a restricted zone based on the location information of the electronic device **300** which is estimated by the location estimation unit **380**. In this case, the emergency information control program **314** may perform control to transmit the emergency signal including the location information of the electronic device **300** which is estimated by the location estimation unit **380**.

The application program **315** includes a software component for at least one application program installed in the electronic device **300**.

The processor unit **320** may include a memory interface **321**, at least one processor **322**, or a peripheral interface **323**. In this case, the memory interface **321**, the at least one processor **322**, and the peripheral interface **323** which are included in the processor unit **320** may be integrated into at least one integrated circuit or be implemented as separate components.

The memory interface **321** controls access to the memory **310** of components, such as the processor **322** or the peripheral interface **323**.

The peripheral interface **323** controls connections of the input/output peripherals of the electronic device **300** to the processor **322** and the memory interface **321**.

The processor **322** enables the electronic device **300** to provide various multimedia services using at least one software program. In this case, the processor **322** performs control to execute at least one program stored in the memory **310** and provide a service corresponding to the program.

The audio processing unit **330** provides an audio interface between a user and the electronic device **300** through a speaker **331** and a microphone **332**. For example, when the emergency information control program **314** identifies that the destination of the emergency signal is the electronic device **300**, the audio processing unit **330** may generate an alert sound for the emergency information through the speaker **331**.

The communication system **340** transmits and receives a signal according to at least one short-range communication method. For example, the communication system **340** may support near-field wireless communication with the counterpart electronic device using at least one short-range communication method of infrared wireless communication, Bluetooth communication, Zigbee or wireless LAN communication.

The input/output control unit **350** provides an interface between an input/output device, such as the display unit **360** and the input device **370**, and the peripheral interface **323**.

The display unit **360** displays the state information of the electronic device **300**, characters input by the user, moving pictures, still pictures, or the like. For example, the display unit **360** displays information about application programs executed by the processor **322**. As another example, the display unit **360** may display emergency information and location information at which an emergency situation occurs which are identified by the emergency information control program **314** as illustrated in FIG. **13**A to FIG. **13**C.

The input device **370** provides input data generated by the selection of the user to the processor unit **320** through the input/output control unit **350**. In this case, the input device **370** includes a keypad including at least one hardware button, a touch pad for detecting touch information, and the like. For example, the input device **370** provides touch information generated by one or more of a touch pen, a finger and a glove worn on a finger on a touchpad to the processor **322** through the input/output control unit **350**.

The location estimation unit **380** estimates the location of the electronic device **300**. For example, the location estimation unit **380** may estimate the location of the electronic device **300** based on a satellite signal provided from a satellite according to a global navigation satellite system (GNSS). As another example, the location estimation unit **380** may estimate the location of the electronic device **300** by using at least one neighboring base station.

As described above, the electronic device **300** may relay the emergency signal received through the communication system **340** toward the short-range communication area. In this case, the processor **322** of the electronic device **300** may be configured as illustrated in FIG. **4** in order to reduce power consumption due to relay of the emergency signal.

FIG. **4** illustrates a detailed block diagram of a processor according to an exemplary embodiment of the present disclosure.

As illustrated in FIG. **4**, the processor **322** may include a first control unit **400**, a second control unit **410**, and a connection control unit **420**.

The first control unit **400** controls the overall operation of the electronic device **300** and enables the electronic device **300** to provide various multimedia services using at least one software program. That is, the first control unit **400** may control the overall operation of the electronic device **300** when the electronic device **300** is in an active mode. For example, when the electronic device **300** that is in the active mode receives an emergency signal through the communication system **340**, the first control unit **400** may analyze the emergency signal and perform control to display emergency information or to broadcast the emergency signal toward a short-range communication area.

The second control unit **410** may perform control when the electronic device **300** is in a freeze mode. That is, the second control unit **410** may perform control to switch the electronic device **300** to the active mode when a service request is detected during a sleep mode. However, when the electronic device **300** that is in the sleep mode receives an emergency signal through the communication system **340**, the second control unit **410** may analyze the emergency signal and perform control to broadcast the emergency signal toward the short-range communication area. That is, the second control unit **410** may broadcast the emergency signal toward the short-range communication area without switching the electronic device **300** to the active mode. When the destination of the emergency signal is the electronic device **300**, the second control unit **410** may switch the electronic device **300** to the active mode in order to display emergency information and a location at which the emergency information is generated.

The connection control unit **240** performs control to transmit the emergency signal provided from the communication system **340** to the first control unit **400** or the second control unit **410** according to the operating mode of the electronic device **300**. For example, when the electronic device **300** is in the active mode, the connection control unit **420** may perform control to transmit the emergency signal provided from the communication system to the first control unit **400**. As another example, when the electronic device **300** is in the sleep mode, the connection control unit **420** may perform control to transmit the emergency signal provided from the communication system to the second control unit **410**.

FIG. **5** illustrates a flowchart for a process of transmitting location information of a missing child using short-range communication according to an embodiment of the present disclosure. In the following description, a third electronic device may include at least one electronic device that relays an emergency signal.

Referring to FIG. **5**, a first electronic device **500** carried by a child and a second electronic device **510** carried by a parent may establish a short-range communication link according to a short-range communication method in a communication system (step **501**). For example, the first electronic device **500** and the second electronic device **510** may establish the short-range communication link according to a Bluetooth method. When the short-range communication link is established, the first electronic device **500** and the second electronic device **510** may generate an alert ID for identifying the short-range communication link. For example, the first electronic device **500** and the second electronic device **510** may generate the alert ID for the short-range communication link by applying a random number to the unique identification information of at least one of the first electronic device **500** or the second electronic device **510**. Alternatively, the first electronic device **500** and the second electronic device **510** may set the unique identification information of their counterpart electronic devices as the alert ID for the short-range communication link. In this case, the unique identification information may include at least one of a MAC address, a MEID, an IMEI or a telephone number.

The first electronic device **500** determines whether an emergency event occurs. For example, the first electronic device **500** may recognize that there occurs an emergency event in which the first electronic device **500** is out of a short-range communication range with the second electronic device **510** when the strength of a signal from the second electronic device **510** is equal to or lower than a reference strength. As another example, the first electronic device **500** may recognize that there occurs an emergency event in which the first electronic device **500** is out of the short-range communication range with the second electronic device **510** when the strength of a signal from the second electronic device **510** is equal to or lower than the reference strength for a reference time.

When the emergency event occurs in the first electronic device **500** (step **533**), the first electronic device **500** broadcasts an emergency signal including the alert ID through a short-range communication network (step **535**). In this case, the first electronic device **500** may broadcast the emergency signal by using a near-field communication method equal to or different from the near-field communication method with the second electronic device **510**. For example, when the short-range communication link is established with the second electronic device **510** using Bluetooth communication,

the first electronic device **500** may broadcast the emergency signal through a Bluetooth communication network. As another example, when the short-range communication link is established with the second electronic device **510** using Bluetooth communication, the first electronic device **500** may broadcast the emergency signal through a wireless LAN. In this case, the emergency signal may include a missing-child occurrence alert message.

In step **537**, the third electronic device **520** adds the location information of the third electronic device **520** when receiving the emergency signal through the short-range communication network. That is, when it is, identified the third electronic device **520** is not the destination of the emergency signal of the third electronic device **520** based on the alert ID of the emergency signal, the third electronic device **520** may add the location information of the third electronic device **520** to the emergency signal. For example, when the emergency signal including no location information is permitted to be transmitted toward the short-range communication area, the third electronic device **520** may add the location information of the third electronic device **520** to the emergency signal. In this case, the third electronic device **520** may add the delivery count and location information of the emergency signal to the emergency signal or updates the same. When the third electronic device **520** may not estimate the location information, the third electronic device **520** may update only the delivery count of the emergency signal.

In step **539**, the third electronic device **520** may broadcast the emergency signal by using the short-range communication. In addition, the third electronic device **520** may transmit a response signal for the emergency signal to the first electronic device **500** or another third electronic device **520**.

In step **541**, the second electronic device **510** may extract and display the emergency information and the location information included in the emergency signal on a display unit when receiving the emergency signal through the short-range communication network. For example, when receiving the emergency signal through the short-range communication network, the second electronic device **510** may identify the destination of the emergency signal by comparing the alert ID of the emergency signal with the alert ID of the short-range communication link with the first electronic device **500**. When the second electronic device **510** is the destination of the emergency signal, the second electronic device **510** may display missing-child occurrence information and an estimated missing-child location **1301** which are extracted from the emergency signal on a map as illustrated in FIG. **13**A. In this case, the second electronic device **510** may display the location **1303** of the second electronic device **510** together with the estimated missing-child location **1301**.

As described above, when the short-range communication link is established between the first electronic device **500** and the second electronic device **510**, the first electronic device **500** may enable the second electronic device **510** to generate an alert event through the short-range communication network. For example, the first electronic device **500** may enable the second electronic device **510** to generate an alert sound through the short-range communication network or to turn on a mars light.

In the above-described embodiment, the second electronic device **510** maintains the short-range communication link with the first electronic device **500** in order to determine whether the first electronic device **500** is out of a reference range (short-range communication area).

According to another embodiment, the first electronic device **500** may measure a distance from the second electronic device **510** by using a short-distance measurement sensor to generate an emergency event.

FIG. **6** illustrates a flowchart for a process of transmitting a missing-child occurrence signal using short-range communication in an electronic device according to an embodiment of the present disclosure. The following description may include the operation flow of the first electronic device **500** carried by a missing-child which is illustrated in FIG. **5**.

Referring to FIG. **6**, in step **601**, the electronic device establishes a short-range communication link with a counterpart electronic device and performs short-range communication with the counterpart electronic device. For example, the electronic device may establish a short-range communication link with the counterpart electronic device according to a Bluetooth method. In this case, the electronic device may generate an alert ID for identifying the short-range communication link with the counterpart electronic device.

In step **603**, the electronic device determines whether an emergency event occurs. For example, when the strength of a signal from the counterpart electronic device is equal to or lower than a reference strength, the electronic device may recognize that there occurs an emergency event in which the electronic device is out of the short-range communication range with the counterpart electronic device. As another example, when the strength of a signal from the counterpart electronic device is equal to or lower than the reference strength for a reference time, the electronic device may recognize that there occurs an emergency event in which the electronic device is out of the short-range communication range with the counterpart electronic device.

When the emergency event does not occur, the electronic device proceeds to step **601** and maintains the short-range communication with the counterpart electronic device.

When the emergency event occurs, the electronic device proceeds to step **605**, and generates an emergency signal including an alert ID for identifying the short-range communication with the counterpart electronic device and broadcasts the emergency signal toward the short-range communication area. In this case, the electronic device may transmit the emergency signal using a short-range communication method identical to or different from the short-range communication method with the counterpart electronic device. For example, when the short-range communication link is established with the counterpart electronic device using Bluetooth communication, the electronic device may broadcast the emergency signal through a Bluetooth communication network. As another example, when the short-range communication link is established with the counterpart electronic device using Bluetooth communication, the electronic device may broadcast the emergency signal through a wireless LAN.

FIG. **7** illustrates a flowchart for a process of identifying missing-child location information using short-range communication in an electronic device according to an embodiment of the present disclosure. The following description may include the operating process of the second electronic device **510** or the third electronic device **520** illustrated in FIG. **5**.

Referring to FIG. **7**, in step **701**, the electronic device determines whether an emergency signal is received through a short-range communication network.

When the emergency signal is not received through the short-range communication network, the electronic device may end the algorithm.

When the emergency signal is received through the short-range communication network, the electronic device identifies an ID of the emergency signal in step **703**. For example,

in a case where the emergency signal includes the variables listed in Table 1, the electronic device may identify the alert ID of the emergency signal.

In step **705**, the electronic device determines whether the alert ID of the emergency signal is included in alert IDs for the short-range communication link stored in the electronic device.

When the alert ID of the emergency signal is included in the alert IDs for the short-range communication link stored in the electronic device, the electronic device displays emergency situation information and location information included in the emergency signal in step **707**. For example, when the emergency signal includes the missing-child occurrence information, the electronic device may display missing-child occurrence information and estimated missing-child location **1301** which are extracted from the emergency signal as illustrated in FIG. **13**A. In this case, the electronic device may display the location of the electronic device together with the estimated missing-child location **1301**.

When the alert ID of the emergency signal is not included in the alert IDs for the short-range communication link stored in the electronic device, the electronic device recognizes that the emergency signal for relay is received. In step **709**, the electronic device adds the location information of the electronic device to the emergency signal. In this case, the electronic device may perform addition of the delivery count of the emergency signal together with the location information.

In step **711**, the electronic device broadcasts the emergency signal including the added location information by using short-range communication.

When the emergency signal is received through the short-range communication network as described above, the electronic device may transmit a response signal in response to the emergency signal. For example, when the emergency signal includes the identification information of the counterpart electronic device that has transmitted the emergency signal, the electronic device may transmit the response signal for the emergency signal to the counterpart electronic device that has transmitted the emergency signal. As another example, the electronic device may broadcast the response signal including at least one of the packet ID or alert ID of the emergency signal toward the short-range communication area.

In the above-described embodiment, when receiving the emergency signal through the short-range communication network, the electronic device may identify the ID of the emergency signal. When the electronic device determines whether the emergency signal is repeatedly received and it is determined that the emergency signal is not repeatedly received, the electronic device may identify the ID of the emergency signal.

FIG. **8** illustrates a flowchart for a process for displaying missing-child location information in an electronic device according to an embodiment of the present disclosure.

Referring to FIG. **8**, when it is determined that the alert ID of the emergency signal is included in the alert IDs for the short-range communication link stored in the electronic device, the electronic device identifies an emergency event type in the emergency signal in step **801**. For example, in a case where the emergency signal includes the variables listed in Table 1, the electronic device may identify emergency situation information included in the emergency signal based on the type information of the emergency signal.

In step **803**, the electronic device identifies the location information included in the emergency signal. For example, in a case where the emergency signal includes the variables listed in Table 1, the electronic device may identify a location at which the emergency situation occurs based on the location information of the emergency signal.

When identifying the emergency situation information and the location information included in the emergency signal, the electronic device displays the emergency situation information and the location information on the display unit in step **805**. For example, when the emergency signal includes the missing-child occurrence information, the electronic device may display missing-child occurrence information and estimated missing-child location **1301** which are extracted from the emergency signal as illustrated in FIG. **13**A. In this case, the electronic device may display the location of the electronic device together with the estimated missing-child location **1301**.

FIG. **9** illustrates a flowchart for a process for relaying missing-child location information in an electronic device according to an embodiment of the present disclosure.

Referring to FIG. **9**, when it is determined that the alert ID of the emergency signal is not included in the alert IDs for the short-range communication link stored in the electronic device in step **705** of FIG. **7**, the electronic device determines whether the emergency signal is permitted to be transmitted additionally in step **901**. For example, the electronic device may determine whether the emergency signal is repeatedly received in consideration of the packet ID information and timestamp information of the emergency signal. When the emergency signal is repeatedly received, the electronic device may determine not to transmit the emergency signal. As another example, the electronic device may determine whether the emergency signal is valid in consideration of the TTL information of the emergency signal. When the emergency signal is not valid, the electronic device may determine not to transmit the emergency signal. As another example, the electronic device may determine whether the emergency signal is repeatedly received and valid to determine whether the emergency signal is permitted to be transmitted additionally.

When the emergency signal is not transmitted additionally, the electronic device may end the algorithm.

When the emergency signal is permitted to be transmitted additionally, the electronic device determines whether location information is permitted to be added to the emergency signal in step **903**. For example, the electronic device may determine whether it is possible to estimate the location of the electronic device. As another example, the electronic device may determine whether location information is included in the emergency signal.

When the location information is permitted to be added to the emergency signal, the electronic device adds the location information of the electronic device to the emergency signal in step **905**. In this case, the electronic device may perform addition of the delivery count of the emergency signal together with the location information.

In step **907**, the electronic device broadcasts the emergency signal having the added location information toward the short-range communication area by using short-range communication.

When the location information is not permitted to be added to the emergency signal, the electronic device broadcasts the emergency signal toward the short-range communication area by using the short-range communication in step **909**.

When the missing-child occurrence information is relayed as illustrated, the electronic device broadcasts the missing-child occurrence information toward the short-range communication area according to the public flag of the emergency signal configured as illustrated in FIG. **1** without displaying the public flag on the display unit.

In the above-described embodiment, the electronic device may broadcast the emergency signal through the short-range communication network according to the short-range communication state with the counterpart electronic device in order to transmit the missing-child occurrence information.

As another embodiment, the electronic device may broadcast the emergency signal through the short-range communication network in consideration of user's manipulation and the location information of the electronic device as illustrated in FIG. **10**.

FIG. **10** illustrates a flowchart for a process of transmitting emergency information using short-range communication according to an embodiment of the present disclosure.

When there occurs an emergency event in a first electronic device **1000** in step **1031** as illustrated in FIG. **10**, the first electronic device **1000** broadcasts the emergency signal through a short-range communication network in step **1033**. When an emergency signal generation menu is selected according to input information provided from the input device **370**, the first electronic device **1000** may broadcast an emergency signal toward the short-range communication area. In another example, when the first electronic device **1000** is out of a limited movement area or enters a restricted zone based on the location information of the first electronic device **1000** which is estimated by the location estimation unit **380**, the first electronic device **1000** broadcasts the emergency signal toward the short-range communication area. In this case, the first electronic device **1000** may broadcast the emergency signal including the location information of the first electronic device **1000** toward the short-range communication area.

The second electronic device **1010** may determine whether the emergency signal is repeatedly received when the emergency signal is received through a short-range communication network. For example, the second electronic device **1010** may determine whether the emergency signal is repeatedly received in consideration of the packet ID information and timestamp information of the emergency signal. When the emergency signal is repeatedly received, the second electronic device **1010** may discard the emergency signal.

When the emergency signal is repeatedly received, the second electronic device **1010** displays the emergency information on the display unit according to the emergency situation information included in the emergency signal in step **1035**. For example, when the emergency signal includes disaster information according to earthquake occurrence, the second electronic device **1010** displays earthquake occurrence information on the display unit on the display unit as illustrated in FIG. **13**B. When the emergency signal includes location information at which the earthquake occurs, the second electronic device **1010** may display the location information **1311** at which the earthquake occurs on a map. As another example, when the emergency signal includes crime prevention information, the second electronic device **1010** displays criminals' location information on the display unit on the display unit as illustrated in FIG. **13**C. In this case, the second electronic device **1010** may display the criminals' location information **1321** on a map.

Thereafter, the second electronic device **1010** determines whether the emergency signal is permitted to be transmitted additionally. For example, the second electronic device **1010** may determine whether the emergency signal is valid in consideration of the TTL information of the emergency signal.

When the emergency signal is valid, the second electronic device **1010** broadcasts the emergency signal through the short-range communication network in step **1037**.

A third electronic device **1020** may determine whether the emergency signal is repeatedly received when the emergency signal is received through a short-range communication network. For example, the third electronic device **1020** may determine whether the emergency signal is repeatedly received in consideration of the packet ID information and timestamp information of the emergency signal. When the emergency signal is repeatedly received, the third electronic device **1020** may discard the emergency signal.

When the emergency signal is not repeatedly received, the third electronic device **1020** displays the emergency information on the display unit according to emergency situation information included in the emergency signal in step **1039**. For example, when the emergency signal includes disaster information according to earthquake occurrence, the third electronic device **1020** displays earthquake occurrence information on the display unit on the display unit as illustrated in FIG. **13**B. When the emergency signal includes location information at which the earthquake occurs, the third electronic device **1020** may display the location information **1311** at which the earthquake occurs on a map. As another example, when the emergency signal includes crime prevention information, the third electronic device **1020** displays criminals' location information on the display unit on the display unit as illustrated in FIG. **13**C. In this case, the third electronic device **1010** may display the criminals' location information **1321** on a map.

Thereafter, the third electronic device **1020** determines whether the emergency signal is permitted to be transmitted additionally. For example, the third electronic device **1020** may determine whether the emergency signal is valid in consideration of the TTL information of the emergency signal.

When the emergency signal is valid, the third electronic device **1020** may discard the emergency signal without additional transmission.

As described above, the second electronic device **1010** and the third electronic device **1020** may broadcast the valid emergency signal toward the short-range communication area. In this case, at least one of the second electronic device **1010** or the third electronic device **1020** may add the location information of the electronic device itself to the emergency signal. When the location information is not included in the emergency signal and it is possible to estimate the location of the second electronic device **1010**, the second electronic device **1010** may add the location information of the second electronic device **1010** to the emergency signal and broadcast the same to the short-range communication area.

FIG. **11** illustrates a flowchart for a process of transmitting emergency information using short-range communication in an electronic device according to an embodiment of the present disclosure. The following description is given under the assumption that the electronic device is able to estimate location information.

Referring to FIG. **11**, in step **1101**, the electronic device determines whether there occurs an emergency event. For example, the electronic device may determine whether an emergency signal generation menu is selected according to input information provided from an input device. As another example, the electronic device may determine whether the electronic device is out of a limited movement area or enters a restricted zone based on the location information of the electronic device.

When the emergency event does not occur, the electronic device may end the algorithm.

When the emergency event occurs, the electronic device estimates a location in step **1103**. For example, the electronic device may estimate the location of the electronic device

based on satellite signals provided from a satellite. As another example, the electronic device may estimate the location of the electronic device by using at least one neighboring base station.

In step **1105**, the electronic device generates an emergency signal including the location information of the electronic device.

After the generation of the emergency signal, the electronic device broadcast the emergency signal through a short-range communication network in step **1107**.

FIG. **12** illustrates a flowchart for a process of identifying emergency information using short-range communication in an electronic device according to an embodiment of the present disclosure.

Referring to FIG. **12**, in step **1201**, the electronic device determines whether an emergency signal is received through a short-range communication network.

When the emergency signal is not received through the short-range communication network, the electronic device may end the algorithm.

When the emergency signal is received through the short-range communication network, the electronic device displays emergency information included in the emergency signal on a display unit in step **1203**. Specifically, when the emergency signal is received through the short-range communication network, the electronic device determines whether the emergency signal is repeatedly received. When the emergency signal is not received repeatedly, the electronic device displays the emergency information included in the emergency signal on the display unit. For example, when the emergency signal includes disaster information according to earthquake occurrence, the electronic device displays earthquake occurrence information on the display unit on the display unit as illustrated in FIG. **13**B. When the emergency signal includes location information at which the earthquake occurs, the electronic device may display the location information **1311** at which the earthquake occurs on a map. As another example, when the emergency signal includes crime prevention information, the electronic device displays criminals' location information on the display unit on the display unit as illustrated in FIG. **13**C. In this case, the electronic device may display the criminals' location information **1321** on a map.

In step **1205**, the electronic device determines whether the emergency signal is permitted to be transmitted additionally. For example, the electronic device may determine whether the emergency signal is valid in consideration of the TTL information of the emergency signal.

When the emergency signal is not permitted to be transmitted additionally, the electronic device may end the algorithm. In this case, the electronic device may discard the emergency signal.

When the emergency signal is permitted to be transmitted additionally, the electronic device broadcasts the emergency signal toward the short-range communication area through the short-range communication network in step **1207**.

As described above, the electronic device relays the emergency information using short-range communication, thereby transmitting the emergency information rapidly and far away without requiring additional cost.

In addition, the electronic device which is in the sleep mode relays the emergency information using short-range communication without activating the control unit, thereby reducing power consumption according to relay of the emergency information.

It will be appreciated that embodiments of the present disclosure according to the claims and description in the specification can be realized in the form of hardware, software or a combination of hardware and software. Any such software may be stored in a non-transient computer readable storage medium. The non-transient computer readable storage medium stores one or more programs (software modules), the one or more programs comprising instructions, which when executed by one or more processors in an electronic device, cause the electronic device to perform a method of the present disclosure. Any such software may be stored in the form of volatile or non-volatile storage such as, for example, a storage device like a ROM, whether erasable or rewritable or not, or in the form of memory such as, for example, RAM, memory chips, device or integrated circuits or on an optically or magnetically readable medium such as, for example, a CD, DVD, magnetic disk or magnetic tape or the like. It will be appreciated that the storage devices and storage media are embodiments of machine-readable storage that are suitable for storing a program or programs comprising instructions that, when executed, implement embodiments of the present disclosure. Accordingly, embodiments provide a program comprising code for implementing apparatus or a method as claimed in any one of the claims of this specification and a machine-readable storage storing such a program. Still further, such programs may be conveyed electronically via any medium such as a communication signal carried over a wired or wireless connection and embodiments suitably encompass the same.

While the disclosure has been shown and described with reference to certain preferred embodiments thereof, it will be understood by those skilled in the art that various changes in form and details may be made therein without departing from the spirit and scope of the disclosure as defined by the appended claims. Therefore, the scope of the disclosure is defined not by the detailed description of the disclosure but by the appended claims, and all differences within the scope will be construed as being included in the present disclosure.

What is claimed is:

1. A method of operating an electronic device, the method comprising:

establishing a short-range communication link with another electronic device using a first short-range communication network;

generating an emergency signal in response to the short-range communication link with the other electronic device being disconnected, the emergency signal including identification information generated by applying a random number to unique identification information of at least one electronic device of the electronic device or the other electronic device; and

broadcasting the emergency signal using a second short-range communication network.

2. The method of claim **1**, wherein generating the emergency signal comprises:

determining whether the short-range communication link with the other electronic device is disconnected based on a strength of a signal provided from the other electronic device through the first short-range communication network; and

generating the emergency signal in response to the short-range communication link with the other electronic device being disconnected.

3. The method of claim **1**, wherein the emergency signal further includes at least one of a packet identifier (ID), a short-range communication link ID, an emergency situation type, an emergency signal create time, a delivery count, a time to live (TTL), a delivery number, or location information.

4. The method of claim **3**, wherein the short-range communication link ID includes the identification information

and the unique identification information includes at least one of a MAC address, a mobile equipment ID (MEID), an International Mobile Equipment Identity (IMEI), or a telephone number.

5. The method of claim **1**, wherein:

the first short-range communication network and the second short-range communication network are identical to or different from each other, and

the first or second short-range communication network includes at least one of infrared wireless communication, Bluetooth communication, Zigbee communication, or wireless LAN communication.

6. A method for receiving an emergency signal in an electronic device, the method comprising:

receiving an emergency signal through a short-range communication network, the emergency signal including identification information generated by applying a random number to unique identification information of at least one electronic device of the electronic device or another electronic device;

determining whether the electronic device is a destination of the emergency signal;

identifying one or more of an emergency situation type or emergency situation location information included in the emergency signal when the electronic device is the destination of the emergency signal; and

displaying one or more of the emergency situation type or the emergency situation location information.

7. The method of claim **6**, wherein the short-range communication network includes at least one of infrared wireless communication, Bluetooth communication, Zigbee communication, or wireless LAN communication.

8. The method of claim **6**, wherein determining whether the electronic device is the destination of the emergency signal comprises determining whether identification information of a short-range communication link included in the emergency signal is included in identification information of at least one short-range communication link stored in the electronic device.

9. The method of claim **6**, further comprising:

determining whether the emergency signal is repeatedly received based on an identifier (ID) of the emergency signal after the emergency signal is received; and

determining whether the electronic device is the destination of the emergency signal when the emergency signal is not repeatedly received.

10. The method of claim **6**, further comprising:

determining whether location information is included in the emergency signal when the electronic device is not the destination of the emergency signal;

adding location information of the electronic device to the emergency signal when the location information is not included in the emergency signal; and

broadcasting the emergency signal using the short-range communication network when the location information is included in the emergency signal.

11. The method of claim **10**, further comprising:

determining whether the emergency signal is valid when the electronic device is not the destination of the emergency signal; and

determining whether the location information is included in the emergency signal when the emergency signal is valid.

12. An electronic device comprising:

at least one short-range communication unit; and

at least one processor configured to

establish a short-range communication link with another electronic device using a first short-range communication network through the short-range communication unit,

generate an emergency signal in response to the short-range communication link with the other electronic device being disconnected, the emergency signal including identification information generated by applying a random number to unique identification information of at least one electronic device of the electronic device or the other electronic device, and

broadcast the emergency signal using a second short-range communication network through the short-range communication unit.

13. The electronic device of claim **12**, wherein the processor is configured to:

determine whether the short-range communication link with the other electronic device is disconnected based on a strength of a signal provided from the other electronic device through the first short-range communication network, and

generate an emergency signal in response to the short-range communication link with the other electronic device being disconnected.

14. The electronic device of claim **12**, wherein the emergency signal further includes at least one of a packet identifier (ID), a short-range communication link ID, an emergency situation type, an emergency signal create time, a delivery count, a time to live (TTL), a delivery number, or location information.

15. The electronic device of claim **14**, wherein the short-range communication link ID includes the identification information the unique identification information includes at least one of a MAC address, a mobile equipment ID (MEID), an International Mobile Equipment Identity (IMEI) or a telephone number.

16. The electronic device of claim **12**, wherein:

the first short-range communication network and the second short-range communication network are identical to or different from each other,

the first or second short-range communication network includes at least one of infrared wireless communication, Bluetooth communication, Zigbee communication, or wireless LAN communication.

17. An electronic device comprising:

a display unit;

at least one short-range communication unit; and

at least one processor configured to:

receive, via the short-range communication unit, an emergency signal through a short-range communication network, the emergency signal including identification information generated by applying a random number to unique identification information of at least one electronic device of the electronic device or another electronic device,

determine whether the electronic device is a destination of the emergency signal,

identify one or more of an emergency situation type or emergency situation location information included in the emergency signal when the electronic device is the destination of the emergency signal, and

instruct the display to display one or more of the emergency situation type or the emergency situation location information.

18. The electronic device of claim **17**, wherein the short-range communication network includes at least one of infra-

red wireless communication, Bluetooth communication, Zigbee communication, or wireless LAN communication.

19. The electronic device of claim **17**, wherein the processor is configured to determine whether identification information of a short-range communication link included in the emergency signal is included in identification information of at least one short-range communication link stored in the electronic device.

20. The electronic device of claim **17**, wherein the processor is configured to:

determine whether the emergency signal is repeatedly received based on an identifier (ID) of the emergency signal after the emergency signal is received, and

determine whether the electronic device is the destination of the emergency signal when the emergency signal is not repeatedly received.

21. The electronic device of claim **17**, wherein the processor is configured to:

determine whether location information is included in the emergency signal when the electronic device is not the destination of the emergency signal;

add location information of the electronic device to the emergency signal when the location information is not included in the emergency signal; and

broadcasts the emergency signal using the short-range communication unit when the location information is included in the emergency signal.

22. The electronic device of claim **21**, wherein the processor is configured to:

determine whether the emergency signal is valid when the electronic device is not the destination of the emergency signal, and

determine whether the location information is included in the emergency signal when the emergency signal is valid.

* * * * *